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A11104 939528

MCCA

MANUFACTURERS COUNCIL ON COLOR AND APPEARANCE

COLLABORATIVE REFERENCE PROGRAM COLOR AND APPEARANCE

ASTM 60° GLOSS

REPORT NO. 27



U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards

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79-1803
1979
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NBS COLLABORATIVE REFERENCE PROGRAMS

TAPPI Paper and Board (6 times per year)

Bursting strength	Smoothness
Tearing strength	Surface pick strength
Tensile breaking strength	K & N ink absorption
Elongation to break	pH
Tensile energy absorption	Opacity
Folding endurance	Blue reflectance (brightness)
Stiffness	Specular gloss, 75°
Air resistance	Thickness
Grammage	Concora (flat crush)
	Ring crush

FKBG-API Containerboard (48 times per year)

Mullen burst of linerboard
Concora test of medium

MCCA Color and Appearance (4 times per year)

Gloss at 60°
Color and color difference
Retroreflectivity

Rubber (4 times per year)

Tensile strength, ultimate elongation and tensile stress
Hardness
Mooney viscosity
Vulcanization properties

ASTM Textiles (3 times per year)

Flammability (FF3-71 and FF5-74)

ASTM Cement (2 times per year)

Chemical (11 chemical components)
Physical (8 characteristics)

AASHTO Bituminous

Asphalt cement (2 times per year)
Cutbacks (once a year)



Collaborative Reference Programs
B360 Polymer Building
National Bureau of Standards
Washington, D.C. 20234

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MANUFACTURERS COUNCIL ON
COLOR AND APPEARANCE

**COLLABORATIVE REFERENCE PROGRAM
FOR
COLOR AND APPEARANCE**

ASTM 60° Gloss

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Office of Engineering Standards
National Engineering Laboratory

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U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards

INTRODUCTION

This Collaborative Reference Program is sponsored jointly by the Manufacturers Council on Color and Appearance and the National Bureau of Standards. Four times per year, gloss chip samples are distributed to each participating laboratory. After the data has been returned to and analyzed by NBS, two reports are sent to each participant. The first, the "preliminary" report, is an individualized report comparing a laboratory's results with the mean of all the results received by the data due date. The second, the "final" report, is a longer report (as illustrated by this report) showing the data from all participants.

A key to the tables and graphs is given on the following pages. Please make special note of the explanation of the "best values" given on page 2 of this report.

If there are any questions on the notes, the analyses, or the reports in general, contact Jeffrey Horlick on (301) 921-2946.

July 30, 1979

KEY TO TABLES AND GRAPHS

- MEAN - The average of individual TEST DETERMINATIONS. The number of TEST DETERMINATIONS in the mean is given in the upper right corner of the first table (TEST D.) and again at the bottom of this table.
- GRAND MEAN - (GR. MEAN) The average of the individual laboratory MEANS, excluding laboratories flagged (see column F) with an X or # .
- DEV - The DEVIation of difference of the laboratory MEAN from the GRAND MEAN.
- N. DEV - The Normal DEVIate or ratio of the DEV to the SD OF MEANS; an indication of the degree of divergence of the laboratory MEAN from the GRAND MEAN.
- INST CODE - Code for instrument type or variation in condition, see second table.
- F - Flag, with following meaning:
- # - Excluded because data were not understood or because analysis indicates extreme performance values or non-compliance with required test procedures.
 - X - Excluded because plotted point would fall outside of the 99% error ellipse, (see below for explanation of Graph).
 - * - Included in grand means but plotted point would fall outside of the 95% error ellipse.
 - 0 - Included in grand mean and inside 95% error ellipse.
- Graph - For each laboratory the MEAN for the second sample is plotted against the MEAN for the first sample, with each point representing a laboratory. The horizontal and vertical lines are the GRAND MEANS. The dashed line is drawn at 45°. The solid sloping line, which may or may not lie close to the 45° line, is along the major axis of the error ellipse. The ellipse is drawn so that, on the average, it will include 95% of the points representing the laboratories.
- The rectangular area represents the ± 5 percent of magnitude of reading which is the ASTM precision statement for reproducibility for 60° gloss.

Plotted symbols are as explained above (under F). A participant whose plotted point falls outside of the ellipse or the rectangular area should carefully re-examine the testing procedure he is following.

Note: Graphs are plotted with an ellipse when there are 20 or more instruments in the analysis. When there are 10 through 19 instruments in the analysis, the graph will be plotted but ellipses will be omitted. When there are fewer than 10 instruments retained in the analysis, the graph will not be plotted.

Best values -

Given at the end of Table 1 for 60° gloss. These values are based on the results obtained by the National Bureau of Standards and the National Research Council of Canada. All participants using equipment that is standard for the analysis should be able to achieve results within the plus-minus (+) limits, which are shown along with the best values.

MCCA COLLABORATIVE REFERENCE PROGRAM
 ANALYSIS C78-1 TABLE 2
 60-DEGREE GLASS
 ASTM METHOD D523

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST	INSTRUMENT---	CONDITIONS
		B45	B46	MAJOR	MINOR	R _o	SDR VAR			
C443	*	61.00	75.00	-7.55	.25	2.69	78C	GLASS, 60	DEGREE,	GARDNER PORTABLE GLASSMETER
C506	*	61.22	74.67	-7.66	-.14	1.82	78E	GLASS, 60	DEGREE,	HUNTER D16 GLASSMETER
C690	Ø	62.85	77.87	-4.16	.67	.82	78B	GLASS, 60	DEGREE,	GARDNER MULTIANGLE GLASSMETER
C475	#	64.25	80.50	-1.25	1.27	1.19	78B	GLASS, 60	DEGREE,	GARDNER MULTIANGLE GLASSMETER
C494	Ø	64.50	80.52	-1.07	1.10	.44	78B	GLASS, 60	DEGREE,	GARDNER MULTIANGLE GLASSMETER
C422	Ø	64.56	80.19	-1.29	.84	1.37	78S	GLASS, 60	DEGREE,	SPECIAL INSTRUMENT
C612	Ø	64.70	81.25	-.38	1.41	.27	78D	GLASS, 60	DEGREE,	GARDNER PRECISION GLASSMETER
C484	#	65.00	81.50	-.00	1.34	1.38	78B	GLASS, 60	DEGREE,	GARDNER MULTIANGLE GLASSMETER
C418	#	65.37	81.62	.34	1.13	.73	78C	GLASS, 60	DEGREE,	GARDNER PORTABLE GLASSMETER
C445	#	65.50	81.82	.57	1.16	1.09	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C440	#	65.57	82.85	1.40	1.76	1.11	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C420	#	65.65	79.90	-.81	-.19	.76	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C467	#	65.80	81.72	-.69	.87	.75	78D	GLASS, 60	DEGREE,	GARDNER PRECISION GLASSMETER
C444	#	65.82	78.57	-1.72	-1.17	1.64	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C479	#	65.90	82.20	1.11	1.10	.73	78D	GLASS, 60	DEGREE,	GARDNER PRECISION GLASSMETER
C504	#	66.07	80.40	-.16	-.19	.64	78L	GLASS, 60	DEGREE,	SHEEN DIGITAL
C455	Ø	66.12	81.07	.39	.20	.98	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C520	Ø	66.25	80.65	.15	-.17	1.08	78K	GLASS, 60	DEGREE,	BYK-MALLINKRODT MULTIGLOSS
C510	Ø	66.25	81.00	.42	.06	1.78	78K	GLASS, 60	DEGREE,	BYK-MALLINKRODT MULTIGLOSS
C454	#	66.38	83.00	2.04	1.24	1.04	78E	GLASS, 60	DEGREE,	HUNTER D16 GLASSMETER
C446	#	66.50	81.75	1.15	.35	1.40	78S	GLASS, 60	DEGREE,	SPECIAL INSTRUMENT
C251	Ø	66.50	81.00	.58	-.13	1.37	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C410F	Ø	66.50	81.00	.58	-.13	.82	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C538	#	66.75	81.50	1.12	-.01	1.96	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C477	Ø	66.80	81.75	1.35	.12	.80	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C437	Ø	66.87	80.10	.13	-1.00	1.40	78D	GLASS, 60	DEGREE,	GARDNER PRECISION GLASSMETER
C281	#	66.97	80.10	.19	-1.08	1.17	78D	GLASS, 60	DEGREE,	GARDNER PRECISION GLASSMETER
C508	#	67.00	81.17	1.03	-.41	.57	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C410C	#	67.00	81.00	.90	-.52	.00	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C410D	#	67.00	78.50	-1.02	-2.12	2.12	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C256	Ø	67.02	79.60	-.16	-1.43	1.27	78E	GLASS, 60	DEGREE,	HUNTER D16 GLASSMETER
C200	#	67.20	81.70	1.56	-.22	.44	78S	GLASS, 60	DEGREE,	SPECIAL INSTRUMENT
C462	#	67.45	81.32	1.44	-.66	.53	78C	GLASS, 60	DEGREE,	RHOTOVOLT MODEL 670
C410B	#	67.50	78.75	-.51	-2.34	.83	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C427	Ø	67.85	82.65	2.71	-.11	.51	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C410A	*	69.00	79.75	1.22	-2.85	1.76	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C576	*	70.30	85.80	6.70	.02	.77	78F	GLASS, 60	DEGREE,	HUNTER D48 GLASSMETER
C495	#	71.00	93.50	13.06	4.42	3.06	78H	GLASS, 60	DEGREE,	GARDNER GLASSGARD-60
C659	#	72.37	90.37	11.54	1.36	1.04	78S	GLASS, 60	DEGREE,	SPECIAL INSTRUMENT
GMEANS:		66.03	80.64			1.00				
		95% ELLIPSE:		6.35	2.80	WITH GAMMA = 50 DEGREES				

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. MCCA Gloss CRP 27	2. Gov't. Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE Manufacturers Council on Color and Appearance COLLABORATIVE REFERENCE PROGRAM, COLOR AND APPEARANCE ASTM 60°, Gloss Report No. 27		5. Publication Date July 30, 1979	
7. AUTHOR(S) J. Horlick, T. L. Cummings		6. Performing Organization Code	
9. PERFORMING ORGANIZATION NAME AND ADDRESS NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, DC 20234		8. Performing Organ. Report No. NBSIR 79-1803	
12. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (Street, City, State, ZIP) Collaborative Testing Services, Inc., 9241 Wood Glade Drive, Great Falls, Virginia 22066; and Manufacturers Council on Color and Appearance		10. Project/Task/Work Unit No.	
15. SUPPLEMENTARY NOTES <input type="checkbox"/> Document describes a computer program; SF-185, FIPS Software Summary, is attached.		11. Contract/Grant No.	
16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.) Collaborative Reference Programs provide participating laboratories with the means for checking periodically the level and uniformity of their testing in comparison with that of other participating laboratories. An important by-product of the programs is the provision of realistic pictures of the state of the testing art. This is one of the periodic reports showing averages for each participant, within and between laboratory variability, and other information for participants and standards committees.		13. Type of Report & Period Covered FINAL	
17. KEY WORDS (six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons) Collaborative reference program; Gloss; Laboratory evaluation; Precision; Reference samples; Testing calibration		14. Sponsoring Agency Code	
18. AVAILABILITY <input type="checkbox"/> Unlimited <input checked="" type="checkbox"/> For Official Distribution. Do Not Release to NTIS <input type="checkbox"/> Order From Sup. of Doc., U.S. Government Printing Office, Washington, DC 20402, SD Stock No. SN003-003- <input type="checkbox"/> Order From National Technical Information Service (NTIS), Springfield, VA. 22161	19. SECURITY CLASS (THIS REPORT) UNCLASSIFIED	21. NO. OF PRINTED PAGES 9	
		20. SECURITY CLASS (THIS PAGE) UNCLASSIFIED	22. Price

